AMENDMENTS TO THE CLAIMS

1.- 42. Cancelled

43. (New) A method for diagnosing one or more latent attributes of an individual comprising:

associating each of a plurality of test items of an examination with the one or more attributes being tested by said test item;

administering the examination to one or more examinees and the individual and recording results thereto;

constructing a first mathematical model comprising a first parameter to measure the effectiveness with which each test item tests for attribute mastery, a second parameter to measure difficulty of each test item, a third parameter to quantify to minor attributes required to correctly answer a test item but for which no first parameter exists, a fourth parameter which measures mastery of the attributes by each examinee, and a fifth parameter which measures latent abilities of each examinee, wherein the first mathematical model is constructed to determine the probability that each examinee correctly answered a test item by correctly applying the attributes associated with the test item;

converting the first mathematical model into a bayesian model by and assigning prior distributions to each of the first parameter, the second parameter, the third parameter, the fourth parameter, and the fifth parameter;

estimating the posterior probability distributions for each of the first parameter, the second parameter, the third parameter, the fourth parameter and the fifth parameter by applying the bayesian model to the results of the administered examination;

for each attribute, calculating a mastery probability for the individual wherein the mastery probability is a measure of the likelihood that the individual has mastered the attribute; and

determining that the individual has mastered the attribute if the mastery probability equals or exceeds a mastery cut-off value.

44. (New) The method of claim 43 wherein the first mathematical model is given by the following equation:

$$\text{Prob}(X_{ij}=1 \mid \alpha, \theta)=S_{ij} \times P(\theta_j+c_i)$$

wherein the S_{ij} term models the concept of positivity and the $P(\theta_j+c_i)$ models the concept of completeness, and wherein the third parameter is represented as c_i for i = 1,2, . . .,n representing the test item number, the fourth parameter is represented as α, and the fifth parameter is represented as θ.

45. (New) The method of claim 44 wherein positivity is given by the following equation:

$$S_{ij} = (\pi_i^*) \times (r_{i1}^*)^{1-\alpha j1} \times (r_{i2}^*)^{1-\alpha j2} \times \ldots \times (r_{im}^*)^{1-\alpha jm}$$

wherein the first parameter is represented as r^*_{ik}, the second parameter is represented as π_i^*, and the fourth parameter is represented as a vector of parameters $\alpha=(\alpha_{j1},\ldots,\alpha_{jm})$ and further wherein j=1,2, . . ,N represents the examinee number, and k=1,...,m represents the attribute number of those attributes required by test item number i.

46. (New) The method of claim 45 wherein:

$$\pi_i^* = \prod \pi_{ik} \text{ (product is over k) and}$$

$$r^*_{ik} = r_{ik} / \pi_{ik}$$

47. (New) The method of claim 43 wherein the bayesian model is a hierarchical bayesian model.

48. (New) The method of claim 43 wherein the prior distribution for the first parameter is a beta distribution.

49. (New) The method of claim 48 wherein the hyperparameters to the beta distribution are in the interval (0,1).

50. (New) The method of claim 43 wherein the prior distribution for the first parameter is a uniform distribution.

51. (New) The method of claim 50 wherein the hyperparameters to the uniform distribution are in the interval (0.5, 2).

52. (New) The method of claim 43 wherein the prior distribution for the second parameter is a beta distribution.

53. (New) The method of claim 52 wherein the hyperparameters to the beta distribution are in the interval (0,1).

54. (New) The method of claim 43 wherein the prior distribution for the second parameter is a uniform distribution.

55. (New) The method of claim 54 wherein the hyperparameters to the uniform distribution are in the interval (0.5, 2).

56. (New) The method of claim 43 wherein the prior distribution for the third parameter is a beta distribution.

57. (New) The method of claim 56 wherein the hyperparameters to the beta distribution are in the interval (0,1).

58. (New) The method of claim 43 wherein the prior distribution for the third parameter is a uniform distribution.

59. (New) The method of claim 58 wherein the hyperparameters to the uniform distribution are in the interval (0.5, 2).

60. (New) The method of claim 43 wherein the prior distribution for the fourth parameter is a multivariate normal prior distribution.

61. (New) The method of claim 60 wherein the hyperparameters for the multivariate normal prior distribution are assigned uniformly in the interval (0,1).

62. (New) The method of claim 43 wherein the mastery cut-off value is approximately 0.65.

63. (New) The method of claim 43 further comprising:

for each attribute, determining that the individual has not mastered the attribute if the mastery probability does not exceed a non-mastery cut-off value.

64. (New) The method of claim 63 wherein the non-mastery cut-off value is approximately 0.35.

65. (New) The method of claim 63 wherein educational intervention is prescribed for the individual for the one or more attributes not mastered.

66. (New) The method of claim 63 wherein additional assessment is prescribed for an individual with a mastery probability which exceeds the non-mastery cut-off value but does not exceed the mastery cut-off value.

67. (New) The method of claim 43 wherein the posterior probability distribution is performed by a computational simulation algorithm.

68. (New) The method of claim 43 wherein the posterior probability distribution is performed by a markov chain monte carlo computational procedure.

69. (New) The method of claim 43 further comprising:

generating a diagnostic report wherein the diagnostic report identifies the attributes which the individual has mastered.

70. (New) A method for evaluating the effectiveness of an examination to test the mastery of one or more latent attributes of one or more examinees, the examination comprising a plurality of test items wherein each test item is designed to test mastery of the one or more attributes, the method comprising:

associating each attribute with the test item which tests for the attribute;

generating examination results;

constructing a first mathematical model comprising a first parameter to measure the effectiveness with which each test item tests for attribute mastery, a second parameter to measure difficulty of each test item, a third parameter to quantify minor attributes required to correctly answer a test item but for which no first parameter exists, a fourth parameter which measures mastery of the attributes by each examinee, and a fifth parameter which measures the latent abilities of each examinee, wherein the first mathematical model is constructed to determine the probability that each examinee correctly answered a test item by correctly applying the attributes associated with the test item;

converting the first mathematical model into a bayesian model by assigning prior distributions to each of the first parameter, the second parameter, the third parameter, the fourth parameter, and the fifth parameter;

estimating the posterior probability distributions for each of the first parameter, the second parameter, the third parameter, fourth parameter and the fifth parameter by applying the bayesian model to the examination results; and

for each attribute, determining that the examination effectively tests for mastery of the attribute if the estimated posterior probability distributions for all test items associated with the attribute satisfy a first criterion.

71. (New) The method of claim 70 wherein the first mathematical model is given by the following equation:

$$\text{Prob}(X_{ij}=1 \mid \alpha, \theta)=S_{ij} \times P(\theta_j+c_i)$$

wherein the S_{ij} term models the concept of positivity and the $P(\theta_j+c_i)$ models the concept of completeness, and wherein the third parameter is represented as c_i for i = 1,2, . . .,n representing the test item number, the fourth parameter is represented as α, and the fifth parameter is represented as θ.

72. (New) The method of claim 71 wherein positivity is given by the following equation:

$$S_{ij} = (\pi_i^*) \times (r_{i1}^*)^{1-\alpha j1} \times (r_{i2}^*)^{1-\alpha j2} \times \ldots \times (r_{im}^*)^{1-\alpha jm}$$

wherein the first parameter is represented as $r^*_{ik,}$ the second parameter is represented as π_i^*, and the fourth parameter is represented as a vector of parameters $\alpha=(\alpha_{ji},\ldots, \alpha_{jm})$ and further wherein j=1,2, . ., N represents the examinee number, and k=1,…,m represents the attribute number of those attributes required by test item number i.

73. (New) The method of claim 72 wherein:

$$\pi_i^* = \prod \pi_{ik} \text{ (product is over k) and}$$

$$r^*_{ik} = r_{ik} / \pi_{ik}$$

74. (New) The method of claim 70 wherein the bayesian model is a hierarchical bayesian model.

75. (New) The method of claim 70 wherein the prior distribution for the first parameter is a beta distribution.

76. (New) The method of claim 75 wherein the hyperparameters to the beta distribution are in the interval (0,1).

77. (New) The method of claim 70 wherein the prior distribution for the first parameter is a uniform distribution.

78. (New) The method of claim 77 wherein the hyperparameters to the uniform distribution are in the interval (0.5, 2).

79. (New) The method of claim 70 wherein the prior distribution for the second parameter is a beta distribution.

80. (New) The method of claim 79 wherein the hyperparameters to the beta distribution are in the interval (0,1).

81. (New) The method of claim 70 wherein the prior distribution for the second parameter is a uniform distribution.

82. (New) The method of claim 81 wherein the hyperparameters to the uniform distribution are in the interval (0.5, 2).

83. (New) The method of claim 70 wherein the prior distribution for the third parameter is a beta distribution.

84. (New) The method of claim 83 wherein the hyperparameters to the beta distribution are in the interval (0,1).

85. (New) The method of claim 70 wherein the prior distribution for the third parameter is a uniform distribution.

86. (New) The method of claim 85 wherein the hyperparameters to the uniform distribution are in the interval (0.5, 2).

87. (New) The method of claim 70 wherein the prior distribution for the fourth parameter is a multivariate normal prior distribution.

88. (New) The method of claim 87 wherein the hyperparameters for the multivariate normal prior distribution are assigned uniformly in the interval (0,1).

89. (New) The method of claim 70 further comprising:

modifying one or more of the test items associated with the latent attribute to improve the estimated posterior probability distribution for the first parameter.

90. (New) The method of claim 70 further comprising:

for each test item, determining that the test item effectively tests for mastery of each attribute associated with the test item when the estimated posterior probability distribution for the first parameter satisfies a second criterion.

91. (New) The method of claim 90 wherein the second criterion is having a value which equals or exceeds approximately 0.65.

92. (New) The method of claim 70 wherein the first criterion is having a value which equals or exceeds approximately 0.65.

93. (New) A system for diagnosing the cognitive attributes of an individual utilizing an examination comprising a plurality of test items, each test item designed to test for examinee mastery of one or more attributes, the system comprising:

a data storage device configured to store data identifying the attributes being tested by each of the plurality of test items and further configured to store the results of administering the examination to a plurality of examinees and to the individual;

a probability generator configured to determine the probability that each examinee correctly answered each of the plurality of test items by correctly applying each of the attributes associated with the test item and further configured to generate a posterior probability distribution for parameters measuring the effectiveness with which each test item measures attribute mastery, the difficulty of each of the plurality of test items, the minor attributes required

to correctly answer each test item but which are not otherwise measured, the mastery of the attributes by each of the examinees, and the latent abilities of each of the examinees;

a mastery analyzer configured to calculate a mastery probability for the individual for each attribute, wherein the mastery probability measures the likelihood that the individual has mastered the attribute; and

a categorizor configured to compare the mastery probability to a first criterion and further configured to categorize the individual based on the results of the comparison.

94. (New) The system of claim 93 wherein the probability generator utilizes the following equation:

$$\text{Prob}(X_{ij}=1 \mid \alpha, \theta)=S_{ij} \text{ x } P(\theta_j+c_i)$$

wherein the S_{ij} term models the concept of positivity and the $P(\theta_j+c_i)$ models the concept of completeness, and wherein the third parameter is represented as c_i for i = 1,2, . . ,n representing the test item number, the fourth parameter is represented as α, and the fifth parameter is represented as θ.

95. (New) The system of claim 94 wherein positivity is given by the following equation:

$$S_{ij} = (\pi_i^*) \text{ x } (r_{i1}^*)^{1-\alpha j1} \text{ x } (r_{i2}^*)^{1-\alpha j2} \text{ x } \ldots \text{x } (r_{im}^*)^{1-\alpha jm}$$

wherein the first parameter is represented as $r^*_{ik,}$ the second parameter is represented as π_i^*, and the fourth parameter is represented as a vector of parameters $\alpha=(\alpha_{ji},\ldots, \alpha_{jm})$ and further wherein j=1,2, . ., N represents the examinee number, and k=1,...,m represents the attribute number of those attributes required by test item number i.

96. (New) The system of claim 95 wherein:

$\pi_i^* = \prod \pi_{ik}$ (product is over k) and

$r^*_{ik} = r_{ik} / \pi_{ik}$

97. (New) The system of claim 93 wherein the first criterion is having a value equaling or exceeding approximately 0.65.

98. (New) The system of claim 97 wherein the individual is categorized as a master of the attribute.

99. (New) The system of claim 93 wherein the first criterion is a value which does not exceed approximately 0.35.

100. (New) The system of claim 99 wherein the individual is categorized as a non-master of the attribute.

101. (New) A system for evaluating the effectiveness of an examination to test the mastery of one or more latent attributes, the examination comprising a plurality of test items wherein each test item is designed to test mastery of the attributes, the system comprising:

a data storage device configured to store data identifying attributes being tested by each of the test items and further configured to store the results of administering the examination to one or more examinees;

a probability generator configured to determine the probability that each examinee correctly answered each of the plurality of test items by correctly applying each of the attributes associated with the test item and further configured to generate a posterior probability distribution for parameters measuring the effectiveness with which each test item measures attribute mastery, the difficulty of each of the plurality of test items, the minor attributes required to correctly answer each test item but which are not otherwise

measured, the mastery of the attributes by each of the examinees, and the latent abilities of each of the examinee; and

an attribute analyzer which, for each attribute, designates the examination for remedial action if the posterior probability for one or more of the test items associated with the attribute fails to satisfy a first criterion.

102. (New) The system of claim 101 wherein the probability generator utilizes the following equation:

$$\text{Prob}(X_{ij}=1 \mid \alpha, \theta)=S_{ij} \times P(\theta_j+c_i)$$

wherein the S_{ij} term models the concept of positivity and the $P(\theta_j+c_i)$ models the concept of completeness, and wherein the third parameter is represented as c_i for i = 1,2, . . .,n representing the test item number, the fourth parameter is represented as α, and the fifth parameter is represented as θ.

103. (New) The system of claim 102 wherein positivity is given by the following equation:

$$S_{ij} = (\pi_i^*) \times (r_{i1}^*)^{1-\alpha j1} \times (r_{i2}^*)^{1-\alpha j2} \times \ldots \times (r_{im}^*)^{1-\alpha jm}$$

wherein the first parameter is represented as r^*_{ik}, the second parameter is represented as π_i^*, and the fourth parameter is represented as a vector of parameters $\alpha=(\alpha_{ji},\ldots,\alpha_{jm})$ and further wherein j=1,2, . . ,N represents the examinee number, and k=1,...,m represents the attribute number of those attributes required by test item number i.

104. (New) The system of claim 103 wherein:

$$\pi_i^* = \prod \pi_{ik} \text{ (product is over k) and}$$

$$r^*_{ik} = r_{ik} / \pi_{ik}$$

105. (New) The system of claim 101 wherein the first criterion is having a value equaling or exceeding approximately 0.65.

106. (New) The system of claim 101 further comprising:

a mastery analyzer configured to calculate a mastery probability for each examinee and each attribute wherein the mastery probability measures the likelihood that the examinee has mastered the attribute.

107. (New) The system of claim 101 further comprising:

an item analyzer which, for each test item designates the test item for remedial action if, for one or more of the attributes associated with the test item, the posterior probability fails to satisfy a second criterion.

108. (New) The system of claim 107 wherein the second criterion is having a value equaling or exceeding approximately 0.65.

109. (New) A method for diagnosing one or more disorders of a patient comprising:

associating each of a plurality of patient characteristics with the one or more disorders;

conducting an examination of a plurality of individuals exhibiting the patient characteristics and identifying which of the plurality of individuals was afflicted by the one or more of the disorders;

conducting an examination of the patient and identifying the presence or absence of each of the plurality of patient characteristics;

constructing a first mathematical model comprising a first parameter to measure the likelihood that the presence of a patient

characteristic indicates the presence of the associated disorder, a second parameter to measure the probability that a particular one of the patient characteristics will be present if none of the associated disorders are present, a third parameter to quantify minor disorders typically present with a particular patient characteristic but for which no first parameter exists, a fourth parameter which measures the presence of the plurality of disorders in each of the plurality of individuals, and a fifth parameter which measures the latent health of each individual, wherein the first mathematical model is constructed to determine the probability that each individual with a patient characteristic is afflicted by the associated disorder;

converting the first mathematical model into a bayesian model by and assigning prior distributions to each of the first parameter, the second parameter, the third parameter, the fourth parameter, and the fifth parameter;

estimating the posterior probability distributions for each of the first parameter, the second parameter, the third parameter, the fourth parameter and the fifth parameter by applying the bayesian model to the results of the examination of the plurality of individuals;

for each disorder, calculating a disorder probability wherein the disorder probability is a measure of the likelihood that the patient is afflicted by the disorder; and

identifying for the patient a list of potential disorders, wherein the list of potential disorders comprises each disorder having a disorder probability in excess of a predetermined value.

110. (New) The method of claim 109 wherein the first mathematical model is given by the following equation:

$$\text{Prob}(X_{ij}=1 \mid \alpha, \theta)=S_{ij} \times P(\theta_j+c_i)$$

wherein the S_{ij} term models the concept of positivity and the $P(\theta_j+c_i)$ models the concept of completeness, and wherein the third parameter is represented as c_i for i = 1,2, . . .,n representing the patient characteristic number, the fourth parameter is represented as α, and the fifth parameter is represented as θ.

111. (New) The method of claim 110 wherein positivity is given by the following equation:

$$S_{ij} = (\pi_i^*) \times (r_{i1}^*)^{1-\alpha j1} \times (r_{i2}^*)^{1-\alpha j2} \times \ldots \times (r_{im}^*)^{1-\alpha jm}$$

wherein the first parameter is represented as r^*_{ik}, the second parameter is represented as π_i^*, and the fourth parameter is represented as a vector of parameters $\alpha=(\alpha_{j1},\ldots,\alpha_{jm})$ and further wherein j=1,2, . . ,N represents the individual number, and k=1,...,m represents the attribute number of those attributes associated with patient characteristic number i.

112. (New) The method of claim 111 wherein:

$$\pi_i^* = \prod \pi_{ik} \text{ (product is over k) and}$$

$$r^*_{ik} = r_{ik} / \pi_{ik}$$

113. (New) The method of claim 109 wherein the bayesian model is a hierarchical bayesian model.

114. (New) The method of claim 109 wherein the prior distribution is a beta distribution.

115. (New) The method of claim 114 wherein the hyperparameters to the beta distribution are in the interval (0,1).

116. (New) The method of claim 109 wherein the prior distribution is a uniform distribution.

117. (New) The method of claim 116 wherein the hyperparameters to the uniform distribution are in the interval (0.5, 2).

118. (New) The method of claim 109 wherein the patient characteristics are symptoms of the disorder.

119. (New) The method of claim 109 wherein the patient characteristics are physical characteristics.

120. (New) The method of claim 109 wherein the prior distribution for the fourth parameter is a multivariate normal prior distribution.

121. (New) The method of claim 120 wherein the hyperparameters for the multivariate normal prior distribution are assigned uniformly in the interval (0,1).

122. (New) The method of claim 109 further comprising:

> for each disorder, determining that the examination effectively tests for the presence of the disorder if the estimated posterior probability distribution for each patient characteristic associated with the disorder satisfies a first criterion.

123. (New) The method of claim 122 wherein the first criterion is having a value equaling or exceeding approximately 0.65.

124. (New) The method of claim 109 further comprising:

> for each patient characteristic, determining that the patient characteristic effectively indicates the presence of the associated disorder if the estimated posterior probability distribution for the first parameter satisfies a second criterion.

125. (New) The method of claim 124 wherein the second criterion is having a value equaling or exceeding approximately 0.65.

126. (New) A method for diagnosing one or more latent characteristics of an object comprising:

associating each of a plurality of observable properties of one or more items with one or more latent characteristics of the items, wherein the items are substantially similar to the object;

examining the one or more items and the object and recording results thereto, wherein the examination comprises recording data associated with each of the plurality of observable properties;

constructing a first mathematical model comprising a first parameter to measure the likelihood that the presence of an observable property indicates the existence of one or more of the latent characteristics, a second parameter to measure the probability that a particular one of the observable properties will be present if none of the associated latent characteristics are present, a third parameter to quantify minor latent characteristics typically present with the observable property but for which no first parameter exists, a fourth parameter which measures the presence of the plurality of latent characteristics in each of the plurality of items, and a fifth parameter which measures the latent qualities of each of the plurality of items, wherein the first mathematical model is constructed to provide the probability that each item with an observable property also possesses the associated latent characteristic;

converting the first mathematical model into a bayesian model by and assigning prior distributions to each of the first parameter, the second parameter, the third parameter, the fourth parameter, and the fifth parameter;

estimating the posterior probability distributions for the first parameter, the second parameter, the third parameter, the fourth parameter and the fifth parameter by applying the bayesian model to the results of the examination;

for each latent characteristic, calculating a first probability wherein the first probability is a measure of the likelihood that the object possesses the latent characteristic; and

identifying a list of the latent characteristics of the object, wherein the list comprises each latent characteristic having a first probability in excess of a predetermined value.

127. (New) The method of claim 126 wherein the first mathematical model is given by the following equation:

$$\text{Prob}(X_{ij}=1 \mid \alpha, \theta)=S_{ij} \times P(\theta_j+c_i)$$

wherein the S_{ij} term models the concept of positivity and the $P(\theta_j+c_i)$ models the concept of completeness, and wherein the third parameter is represented as c_i for i = 1,2, . . .,n representing the observable property number, the fourth parameter is represented as α, and the fifth parameter is represented as θ.

128. (New) The method of claim 127 wherein positivity is given by the following equation:

$$S_{ij} = (\pi_i^*) \times (r_{i1}^*)^{1-\alpha j1} \times (r_{i2}^*)^{1-\alpha j2} \times \ldots \times (r_{im}^*)^{1-\alpha jm}$$

wherein the first parameter is represented as r^*_{ik}, the second parameter is represented as π_i^*, and the fourth parameter is represented as a vector of parameters $\alpha=(\alpha_{ji},\ldots,\alpha_{jm})$ and further wherein j=1,2, . . ,N represents the item number, and k=1,...,m represents the latent characteristic number of those latent characteristics associated with observable property number i.

129. (New) The method of claim 128 wherein:

$\pi_i^* = \prod \pi_{ik}$ (product is over k) and

$r^*_{ik} = r_{ik} / \pi_{ik}$

130. (New) The method of claim 126 wherein the bayesian model is a hierarchical bayesian model.

131. (New) The method of claim 126 wherein the prior distribution is a beta distribution.

132. (New) The method of claim 131 wherein the hyperparameters to the beta distribution are in the interval (0,1).

133. (New) The method of claim 126 wherein the prior distribution is a uniform distribution.

134. (New) The method of claim 133 wherein the hyperparameters to the uniform distribution are in the interval (0.5, 2).

135. (New) The method of claim 126 wherein the prior distribution for the fourth parameter is a multivariate normal prior distribution.

136. (New) The method of claim 135 wherein the hyperparameters for the multivariate normal prior distribution are assigned uniformly in the interval (0,1).

137. (New) The method of claim 126 further comprising:

for each observable property, determining that the observable property effectively indicates the presence of the associated latent characteristic if the estimated posterior probability distribution satisfies a first criterion.

138. (New) The method of claim 137 wherein the first criterion is having a value equaling or exceeding approximately 0.65.

139. (New) The method of claim 126 further comprising:

for each latent characteristic, determining that the examination of the object effectively tests for the presence of the latent characteristics if the estimated posterior probability distribution for each observable property associated with the latent characteristic satisfies a second criterion.

140. (New) The method of claim 139 wherein the second criterion is having a value equaling or exceeding approximately 0.65.

STATUS AND SUMMARY

Claims 1-42 have been rejected under 35 U.S.C. §101 on the stated basis that the claimed invention is directed to non-statutory subject matter. Specifically, the Examiner states that claims 1-42 are directed to a method of constructing mathematical models which are abstract ideas. Further, the Examiner states that the claimed subject matter does not provide a result which is concrete or tangible, and therefore fails the judicially created test for patentability under § 101.

Applicants have cancelled Claims 1-42 and submitted new claims 43-140. Applicants submit that new claims 43-140 are directed to statutory subject matter and satisfy the judicially created test for patentability under § 101.